


There's Gold in Them Thar Towers

Broward County Water Resource Task Force

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Objectives

- Describe the cooling process
- Discuss water conservation opportunities
- Present possible implementation strategies




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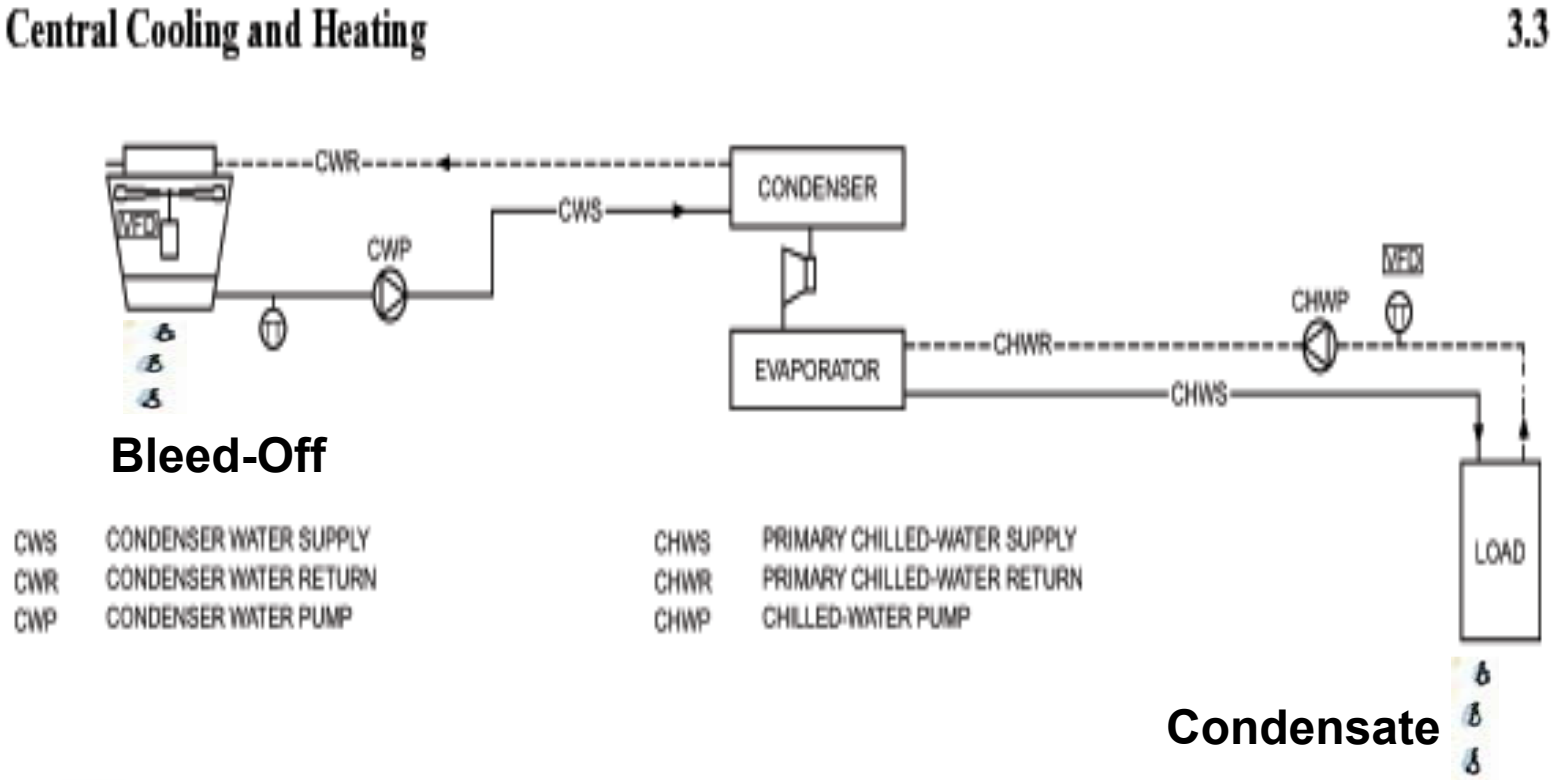
Cooling Process



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Cooling Tower Use in Broward

- The Broward County Property Appraiser list
  - Commercial Properties – 21.7 Billion Sq. Ft.
  - Larger than 20,000 Sq. Ft. – 234 million Sq. Ft.




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A/C Rule of Thumb

- Retail Buildings = 250 - 300 sq. ft. per ton of cooling
- Office Buildings = 400 - 500 sq. ft. per ton of cooling
- Condominiums = 500 - 600 sq. ft. per ton of cooling

- Average base of 425 sq. ft. per ton

- This average is 234,685,169 sq. ft./425 sq. ft. per ton = 552,200 tons total




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How Much Condensate is Generated

- The rule of thumb is 3,434 gal. per day per 1,000 tons, therefore the water saved would be (552,200 tons/1000 tons)*(3,434 gals per day/ 1,000,000) = **1.9 MGD** County Wide




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What happens to the A/C Condensate in These Buildings

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What Is Cooling Tower Bleed-Off

- Towers cool by evaporation
- Evaporation increases mineral concentrations
- Make-up water contains less minerals than is in Bleed-off water therefor the addition of potable water is used to reduce mineral concentrations




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How Much Water is Lost?

- Design standard is 5 cycles of concentration
- Typical system operates at 3 cycles of concentration which results in more water loss
- Average operating time per Bldg. = 16 hours per day
- Average annual cooling tower load is 70% of maximum capacity
- Bleed-off Rate (Water Lost):

  1.8 gal/hr/ton divided by (cycles-1) x tons x hrs/day = Gallons of Bleed-off per day.

1.8 / (3 - 1) x 552,200 x 16 x 70% ≈ **5.6 MGD** County Wide




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What Happens to the Bleed-Off?

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What Should be Done?

- Collect A/C condensate and return to Cooling Towers for makeup (This will pay for itself)
- Require no bleed tower water treatment systems – at least two are on the market (This will pay for itself)
- Possible water savings – 5 to 7.5 MGD
- Reduce sanitary treatment by 3 to 5.6 MGD




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Typical pricing for condensate recovery systems

	20 gallon	45 gallon
Condensate tank *(see note at bottom)*	$2,000.00	$10,000.00
Electrical wiring (subcontractor) for condensate tank pump *(includes permit, wiring materials, labor etc.)*	$1,200.00	$1,500.00
Piping materials to connect AHU condensate to tank on the same floor *(100' of copper pipe, permit, valves, fittings, hangers, supports, vibration isolation, etc.)*	$800.00	$1,100.00
Labor to install piping for AHU condensate tank on same floor	$1,500.00	$1,800.00
Total	**$5,500.00**	**$14,400.00**
Add per floor *(if condensate is not on the same floor)* *(includes coring of concrete floor, piping, hangers, labor etc)*	$1,250.00	$1,500.00

Example 28 story high rise with a/c units on each floor and condensate tank on the ground Best case - same floor ($14,400) Worst case -piped to roof ($14,400.00 + $35,000 = $49,400.00)

Use the 45 gallon tank for larger buildings (20 stories or more)

Savings per Year for a 1000 Ton System

3,434 gals per day x 6 days x 52 weeks x $3.30/1,000gal = $3,535.00

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Typical Bleed Water Cost Comparison average case

- **Avg. 3 Cycle** Bleed-off = 310,603 gal.
  - Water Cost at $7.84/1000 gal. = $2,345.00
- **Zero** Bleed-off = 0 gal.
  - Water Cost at $7.84/1000 gal. = $ 0.00,
- **Total Water Savings = 260,064 gallons**
- **Total Monetary Savings = $2,345.00**




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Monthly Treatment Program Cost Comparison

- **Current Program Costs** — **No Bleed Program Costs**
  W/S Salt Cost = $ 150.00
- Est. Treatment Service = $ 666.00 — Est. Treatment Service = $ 1,650.00
- Bleed-off Cost = $ 2,345.00 — Bleed-off Cost = $ 0.00
- **Total Cost = $ 3,011.00** — **Total Cost = $ 1,800.00**
- **Total Annual Savings After Deducting the No Bleed Program Costs**
  - Savings calculations are based on a new 1000 ton cooling tower system. The total water/ sewer costs for this building as supplied by the City of Fort Lauderdale municipality are $3.30/$4.54 per1000 gallons.

- **$ 3,011.00 - 1,800.00 = $ 1,211.00 per Month x 12 Months Equals:**
  - **$14,532.00 Annual Program Savings**

- **3,120,768 Gallons Of Water/Sewer Saved Per Year**

- **Or 5.6 MGD County Wide**

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Possible Implementation Strategy

- Submit changes to the Florida Building Commission for revision to 2010 Florida Building Code.
  - Request Cities and County to send letters in support of Building Code Amendments.
- Submit to Broward County Board of Rules & Appeals if Florida Building Code revisions fail.
- Draft ordinances if not approved by Board of Rules & Appeals




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FLORIDA MECHANICAL CODE

301.11 Repair. Defective material or parts shall be replaced or repaired in such a manner so as to preserve the original approval or listing. Cooling tower replacement shall comply with Section 307.2.1 and 908.6 of the FMC.

307.2 Evaporators and cooling coils. Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 307.2.1 through 307.2.4.

307.2.1 Condensate disposal. Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to the cooling tower or other location where it will be used in lieu of potable water. (an approved place of disposal. Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.)




908.6 Drainage. Drains and overflows (Drains, overflows and blowdown) provisions shall be indirectly connected to an approved disposal location. Chemical treatment systems shall be installed to limit the requirement for bleed off to less than . 005 gallons per ton per day. Blowdowns shall be installed with a water meter to verify flow and the discharge modified in a manner (Discharge of chemical waste shall be) approved by the appropriate regulatory authority.

FLORIDA BUILDING CODE, EXISTING BUILDINGS

SECTION 508

MECHANICAL

508.1 General. Existing mechanical systems undergoing repair shall comply with Section 301.11 of the Florida Building Code, Mechanical and shall not make the building less conforming than it was before the repair was undertaken.




San Antonio Code

Sec. 34-274. Other activities to be regulated on and after January 1, 2006.

The following activities shall be regulated in the manner set out herein on and after January 1, 2006. A person affected by such regulations may request a variance in the manner set out in section 34-277. A violation of this section and subsections shall be subject to enforcement provisions set out in section 34-278. It shall be and is hereby declared unlawful for any person to violate, refuse or fail to implement the requirements of this division.

(1) *Condensate collection.* Newly constructed commercial buildings installing air conditioning systems on and after January 1, 2006, shall have a single and independent condensate wastewater line to collect condensate wastewater to provide for future utilization as:

a. Process water and cooling tower make-up, and/or

b. Landscape irrigation water. Condensate wastewater shall not be allowed to drain into a storm sewer, roof drain overflow piping system public way or impervious surface.

(2) *Rain sensors.* Effective January, 1, 2006, rain sensors shall be installed and maintained on all irrigation systems equipped with automatic irrigation controllers.

(Ord. No. 100322, § 1(Att. A), 1-20-05)




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San Antonio Code

(3) *Cooling towers*. Effective January 1, 2006:

a. Cooling towers, not utilizing recycled water, shall operate a minimum of four (4) cycles of concentration.

b. Newly constructed cooling towers shall be operated with conductivity controllers, as well as make-up and blowdown meters.

- **Las Vegas has code pending vote this week**




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Summary

- Possible savings of up to 7.5 MGD of water consumption. 25% of 2025 shortfall
- Possible savings in water treatment of up to 5.6 MGD
- These measures pay for themselves.
- What better way to be GREEN.




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